RESEARCH REPORT
(for RTOPs and Grants)

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4.A. JPL Project Number: 102294-982745.03.13	**(Per GSK Policy, this serves as the Work Authorization Document)**	**4.C. NASA WBS NUMBER** 982745.02.02.03.13
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8. Reference **NRA Number: NNH07ZDA001N-AISR**		

9. Funding Profile:	**FY'07 Prior Approvals**	**FY'08 Current Guideline**	**FY'08 Current Request**	**FY'08 Current Overguide**	**FY'09 Next Request**
	$ 195.6 K	$ 200.7 K	$ 200.7 K	$ 0 K	$ 206.8 K

10. Description

A. Goals

Current methods for atmosphere and ocean prediction propagate gridded state variables, or ensembles thereof, forward in time. Powerful as these methods are, they do not handle outliers well and cannot simultaneously entertain multiple hypotheses about system state.

In this work, we will develop new methods for representing and propagating statistical distributions, which handle outliers and encode multiple competing hypotheses about weather system state. We allow the distributions representing states to undergo nonlinear evolution as time unfolds, rather than making simplifying assumptions (e.g. linear/Gaussian) that can result in inaccurate predictions.

B. Progress and Accomplishments in the Past Year

We selected a simulation data set for initial object tracking proof of concept. This simulation data set is from a reduced-order, shallow-water equation model for mid-latitude meso-scale vortices data set. We have developed and tuned the object-tracking parameters of our existing tracking code so that we are now able to extract tracks from this data set. On the nonlinear system evolution side, we have begun work on faster sampling methods for the two-sided boundary value problem using the Lorenz system as the initial basis for development. Executed subcontract with co-I Michael Ghil of UCLA.

C. Plans for the Coming Year

We will proceed to select real data for the object-tracking and dynamics-learning demonstration. We will work further on learning forward object dynamics for simulation data as well as extending learning of object dynamics to real data.

Approval: **Date:**	**Concurrence:** **Date:**
Elizabeth Kay-Im	Charles Norton